



APPLICATION NOTE

AP-138



This application note will examine and describe a socket adapter that will allow a 2816 EPROM to be programmed in a 2716 EPROM socket. The adapter is used to program the 2816 in a 2716 socket. The adapter is used to program the 2816 in a 2716 socket. The adapter is used to program the 2816 in a 2716 socket.

HARDWARE

The hardware shown in Figure 1 is a simple socket adapter. It is a 2816 EPROM socket that has been modified to accept a 2716 EPROM. The adapter is used to program the 2816 in a 2716 socket. The adapter is used to program the 2816 in a 2716 socket.

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A 2716 to 2816 Programming Socket Adapter

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INTRODUCTION

This application note will examine and discuss a socket adapter that allows the user to interface a 2816 E²PROM with a 2716 EPROM programmer. The adapter permits the programmer to exercise the features of the 2816—read, byte write and chip erase. Compatibility with most 2716 programmers is achieved through a small component count, thereby providing a cost-efficient means of programming E²PROMS.

HARDWARE

The E² pinout, shown in Figure 1, is nearly identical to that of the industry standard, JEDEC approved 2716 EPROM. There are, however, several major differences in the three control signals, V_{pp}, CE, and OE. These signals require special circuitry to permit the 2816 to be programmed by a 2716 programmer. One of these circuits is for generating the 2816 programming voltage waveform, V_{pp}. Figure 2 exhibits the difference between the V_{pp} waveforms of the 2716 and

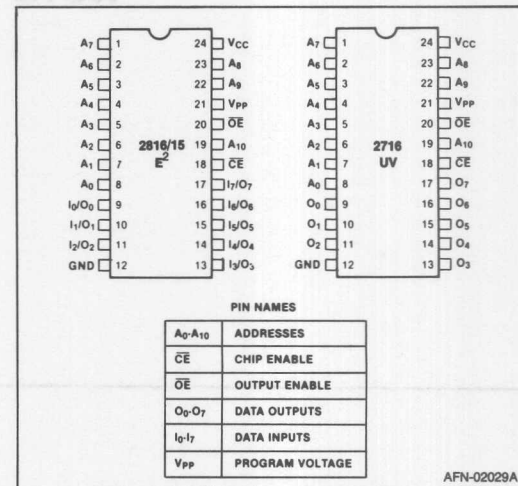


Figure 1. 2816 Pinout

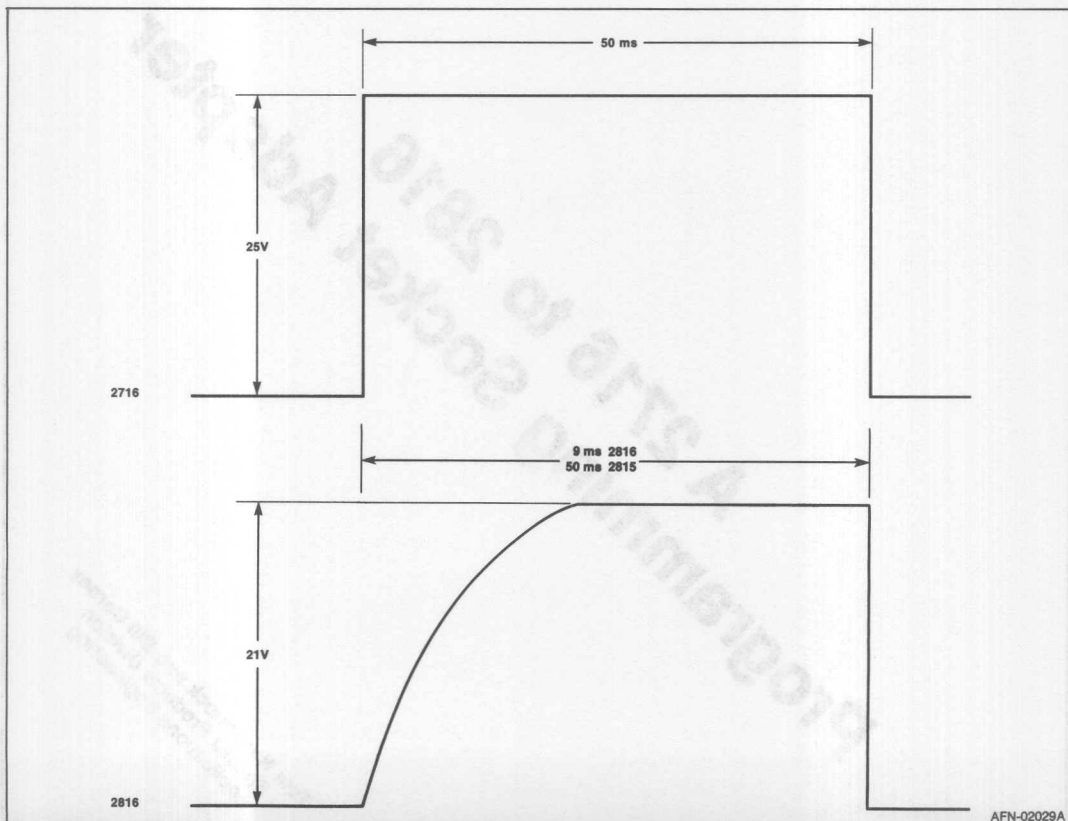


Figure 2. V_{pp} Waveform for 2716 and 2816

2816. The 2716 EPROM is programmed by a 25V, 50 ms long pulse per byte, whereas the 2816 E²PROM requires a 21V pulse of 9 to 15 ms in duration. The 2815, a new 16K E²PROM, requires a 50 ms pulse. The socket adapter can be set for either value, by a simple resistor/capacitor change. For the capability to program both, the pulse width can be set at 50 ms. Additionally, the V_{PP} pulse must possess a specific exponential rise time constant. Therefore, special waveshaping and timing circuitry is necessary to produce an E²PROM programming pulse from the 2716 programmer's output. (The nature of the V_{PP} pulse is explained in detail in AP-101.)

Figure 3 shows the circuit that will produce the 2816/15 compatible programming pulse as well as the CE signal. The 4011 CMOS NAND gates are required to isolate the adapter from the programmer outputs. A TTL 7400 bipolar NAND gate cannot be used as its outputs would appear to the programmer as a leaky MOS device and can cause the programming operation to cease in some manufacturer's programmers.

Upon assertion of $\overline{\text{CE}}$ by the 2716 programmer, the adapter circuitry provides a $\overline{\text{CE}}$ -out signal to the socket containing the 2816. If V_{PP} should be applied at this time, the 9602 one-shot is triggered and generates a pulse of approximately 12 ms. This pulse is then shaped by the dual op-amp circuit to produce the correct exponential rise necessary to program the 2816. The rise time constant is determined by the 10K resistor and the 0.05 μF capacitor and is nominally 500 μsec . The net result of the circuitry of Figure 3 is the transformation of a 25V, 50 ms square pulse into a 12 ms long, 21V programming pulse with a 500 μs rise time constant, and the generation of the CE signal. For the 2815, this pulse width is 50 ms.

In Figure 4, V_{PP} will pass uninterrupted to the 2816 through the DH0006 current driver when a programming operation is performed. If, however, the E²PROM is to be chip erased, then the switch is placed as shown. This causes the digital feedback network, consisting of the two 74LS74 flip-flops, to be connected to the DH0006 current driver. This feedback has the

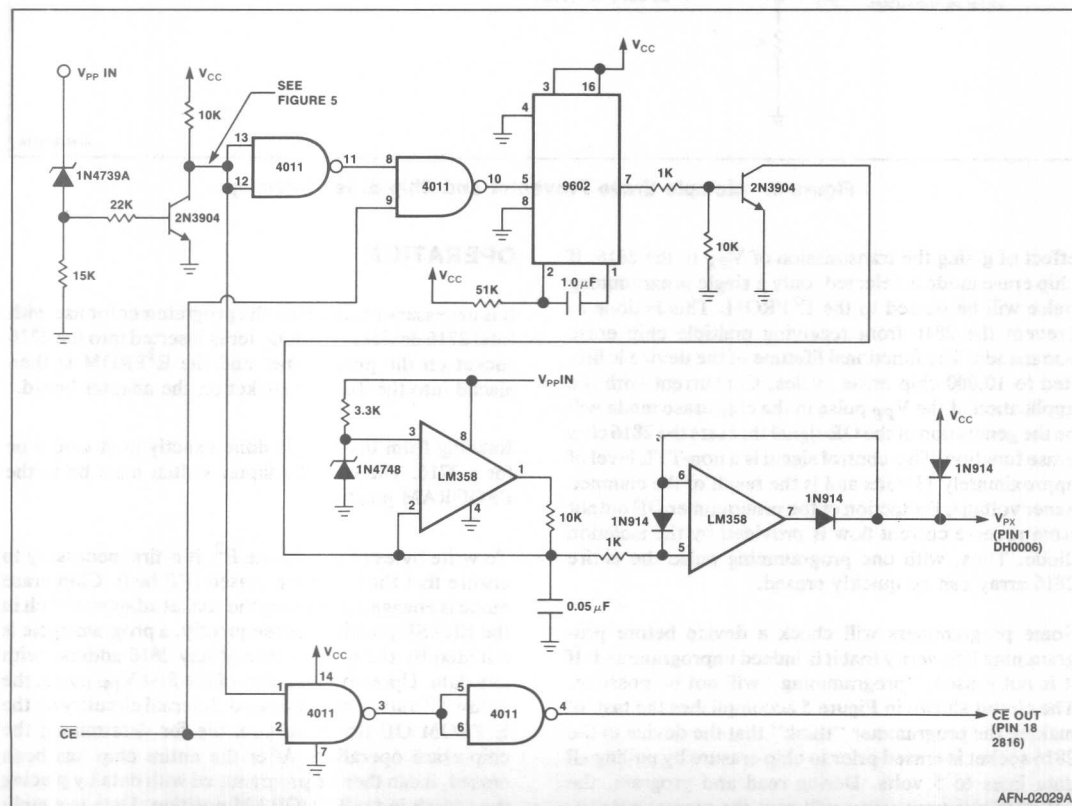


Figure 3. 2816 Socket Adapter for 2716 Programmers

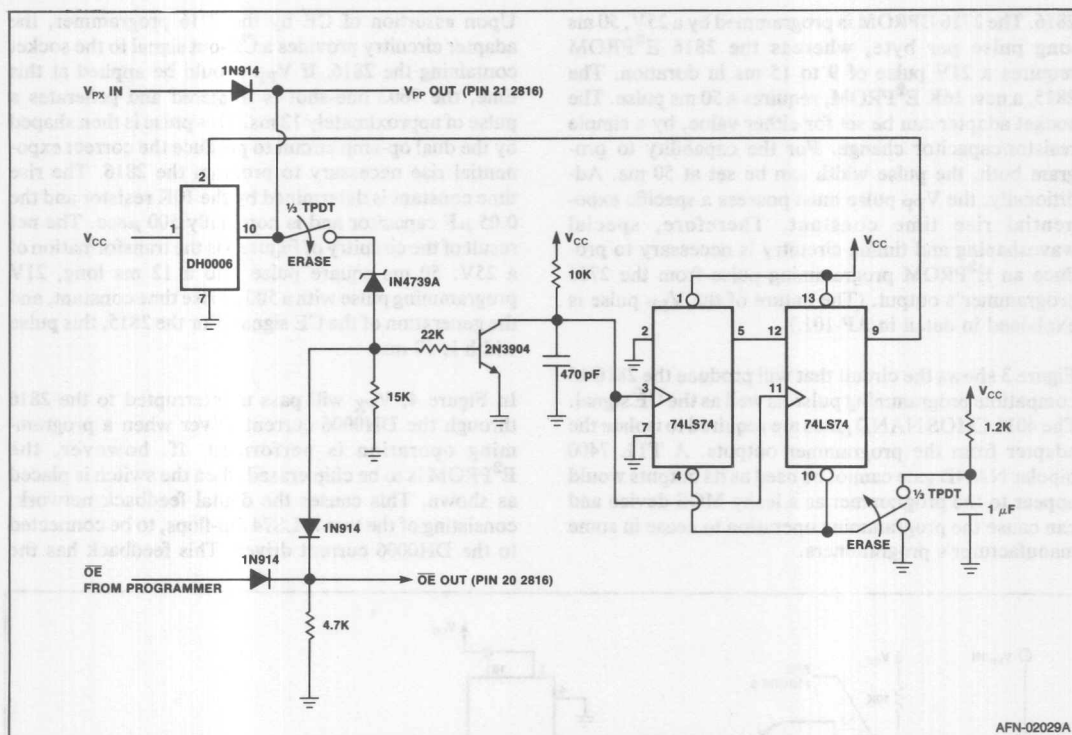


Figure 4. Multiple Erase Preventer and Chip Erase Circuitry

effect of gating the transmission of V_{PX} to the 2816. If chip erase mode is selected, only a single programming pulse will be passed to the E^2 PROM. This is done to prevent the 2816 from receiving multiple chip erase commands. The functional lifetime of the device is limited to 10,000 chip erase cycles. Concurrent with the application of the V_{PP} pulse in the chip erase mode will be the generation of the OE signal that sets the 2816 chip erase function. This control signal is a non-TTL level of approximately 13 volts and is the result of the clamped zener voltage. Protection of the programmer OE output from reverse current flow is provided by the isolation diode. Thus, with one programming pulse the entire 2816 array can be quickly erased.

Some programmers will check a device before programming it to verify that it is indeed unprogrammed. If it is not erased, "programming" will not be possible. The circuit shown in Figure 5 accomplishes the task of making the programmer "think" that the device in the 2816 socket is erased prior to chip erasure by pulling all data lines to 5 volts. During read and program, the 74LS245 bus transceiver will pass the correct data between the programmer and the E^2 PROM.

OPERATION

It is necessary to configure the programmer for use with Intel 2716 devices. The adapter is inserted into the 2716 socket on the programmer and the E^2 PROM is then placed into the Textool socket on the adapter board.

Reading from the 2816 is done exactly as it would be for a 2716. The socket adapter switch must be in the PROGRAM position.

To write bytes of data to the E^2 , it is first necessary to ensure that the bytes are erased (FF hex). Chip erase mode is engaged by placing the socket adapter switch in the ERASE position. Subsequently, a program cycle is initiated by the programmer at any 2816 address with any data. Upon the assertion of the first V_{PP} pulse, the entire 2816 array will be erased. Internal circuitry on the E^2 PROM OE line is responsible for determining the chip erase operation. After the entire chip has been erased, it can then be programmed with data by placing the switch in the PROGRAM position. Data is simply programmed with the device at the desired locations.

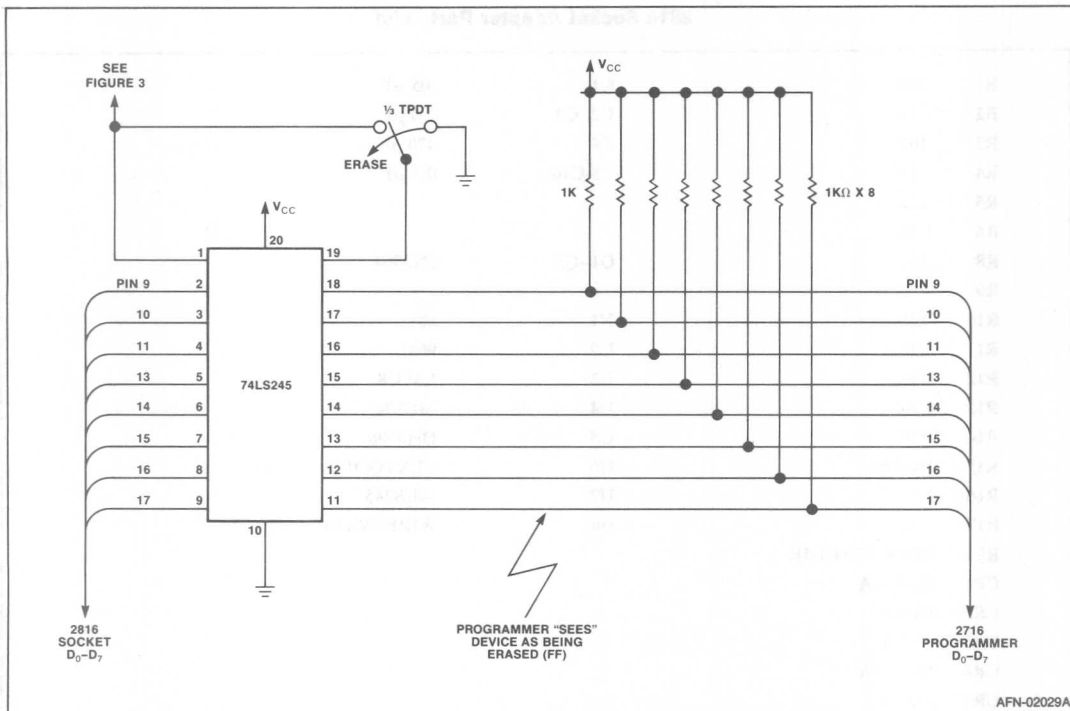


Figure 5. Erase Conditioner

Some programmers will not generate a V_{PP} pulse or else skip over a given address if the data is FF (Pro-Log and DATA I/O are examples). For this reason, some type of data must be “programmed” into the device prior to the chip erasure mode. Since the device will become erased as expected by the user but not the programmer, the 2816 will fail subsequent verifies and an error message will ensue. This is typical of most programmers.

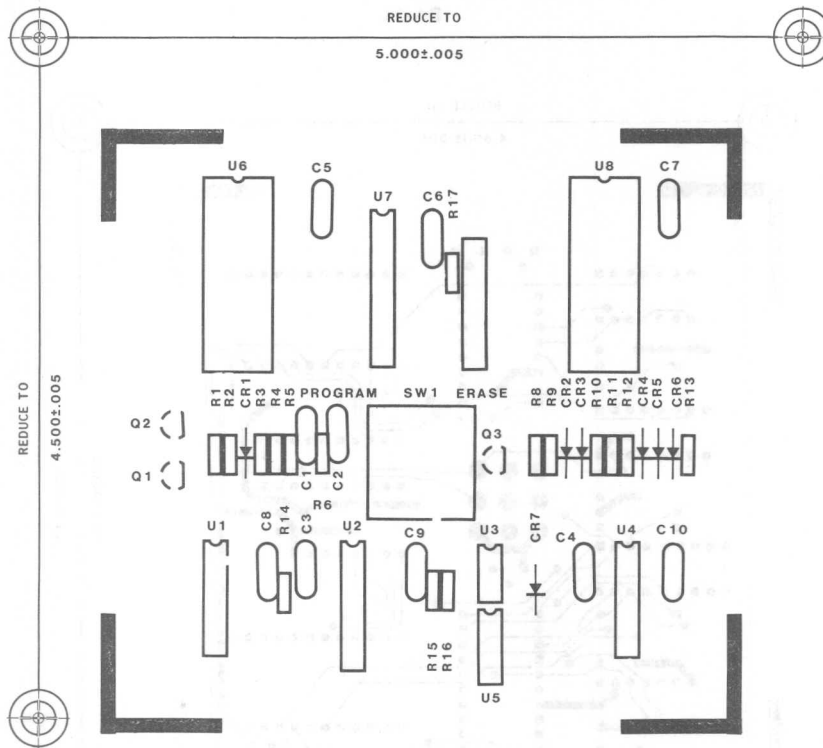
CONCLUSION

E²PROM is ideally suited in applications requiring that program store or data be revised occasionally. The 2816 socket adapter allows the user to program E²PROMs on his existing EPROM hardware.

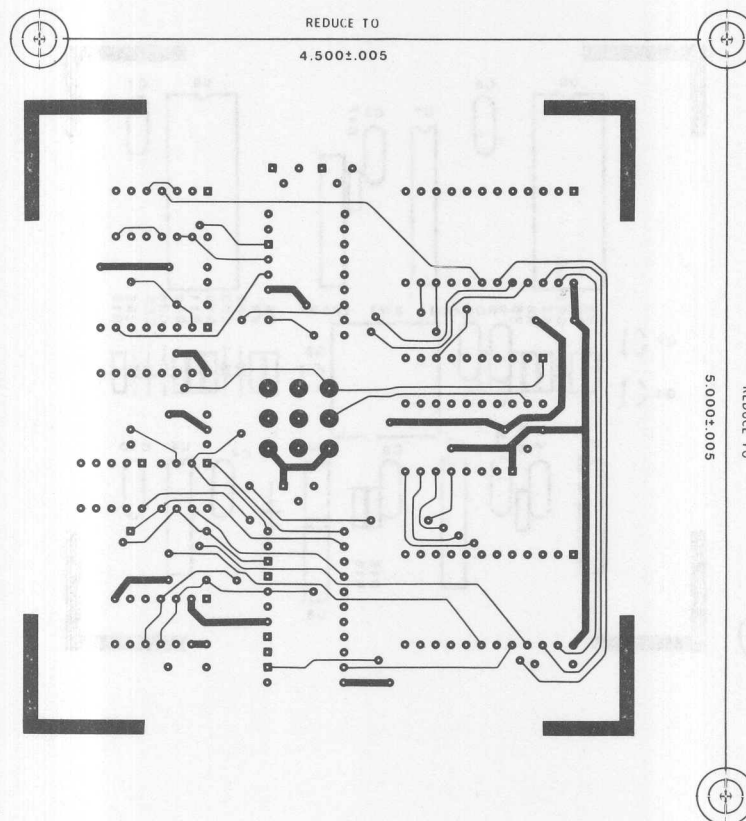
2816 Socket Adapter Parts List

R1	22K	C1	.05 μ F
R2	15K	C2, C3	1.0 μ F
R3	10K	C4	470 pF
R4	1K	C5-C10	0.1 μ F
R5	10K		
R6	1.2K		
R8	10K	Q1-Q3	2N3904
R9	1K		
R10	10K	U1	4011
R11	22K	U2	9602
R12	15K	U3	LM358
R13	4.7K	U4	74LS74
R14	51K	U5	DH0006
R15	1N4748	U6	TEXTTOOL SOCKET
R16	2.7	U7	74LS245
R17	1K	U8	WIRE-WRAP PINS
RP1	SIP X 7 764-1-1K		
CR1	1N4739A		
CR2	1N914		
CR3	1N914		
CR4	1N4739A		
CR5	1N914		
CR6	1N914		
CR7	1N914		
CR8	1N914		
S1	TPDPT		

AP-138



BACK



FRONT

